REMARKS

Claims 18-22 remain in this case. Claim 18 has been amended to more clearly reflect the invention. Support for this change is found in the specification at page 10, lines 14-17. Claim 21 has been amended to be more consistent with the language of the other claims. No new claims have been added and no new matter has been added. No additional fees are due for the claims. The pending claims are under non-final rejection. Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

Rejection of Claim 21 under USC 103(a)

The Examiner has rejected claim 21 as being unpatentable under USC 103(a) over Kanai (JP 402290138A) in view of Fitter (U.S. Patent No. 4,897,626). Applicant respectfully traverses this rejection. There is no teaching in either reference that would suggest combining them. But even if the references were combined, the combination would not yield the present application. Figure 1 of the Kanai reference clearly illustrates only one end of the heat dissipation plate extending beyond the peripheral surface of the field winding. The Abstract of Kanai confirms this teaching with the statement that only "a part" (i.e. one end) of the heat dissipation plate projects beyond the outer peripheral surface of the field winding. It is therefore evident that Kanai teaches only one end – not two ends -- of the heat dissipation plates projecting beyond the core to dissipate heat. The Examiner further relies upon the teachings of Fitter to show thermally conductive strips of a non-metallic material. However, Fitter actually teaches the use of a non-magnetic material. This teaching is significant since non-magnetic and non-metallic are not synonymous terms and the properties of the materials that would be desirable in each of these categories differ markedly from each other. Further, a given material that would be effective in one category (non-magnetic) would not be effective in the other category (non-metallic). This is evidenced by the fact that Fitter can utilize a metal or a ceramic equally well to satisfy its

objective (i.e. providing a non-magnetic material), while the present invention cannot utilize a metal for its purposes (i.e. providing a non-metallic material). A combination of Kanai and Fitter would therefore provide non-magnetic conductive strips with one end acting to remove heat. This does not render obvious the claimed invention which provides non-metallic thermally conductive strips with each of two ends acting to remove heat.

Rejection of Claims 19 and 21 under USC 103(a)

The Examiner has rejected claims 19 and 21 as being unpatentable under USC 103(a) over Oigawa (EP 0462005) in view of Fitter (U.S. Patent No. 4,897,626). Applicant respectfully traverses this rejection. There is no teaching or suggestion in either of the references that combining the references would provide any benefit. However, a combination of the references does not produce the claimed invention. According to both references, the strips 40 (Fitter) and the plates 109 and 110 (Oigawa) are not capable of dissipating sufficient heat through just the ends. The entire surface area of strips 40 and plates 109 and 110 is required to dissipate the heat. In fact, Fitter (column 3, lines 38-48) teaches that the strips 40 are added because a shortening of the flux paths 30 and 32 reduces the surface area of the magnetic frame elements and impairs their ability to dissipate heat. As a result, Fitter added conductive strips 40 to increase in the overall surface area by which heat may be dissipated. Similarly, Oigawa (column 6, lines 22-24; column 7, lines 37-42) teaches that the surface area of the radiating plates can be increased to enhance heat dissipation. This surface area for heat dissipation is so important in Oigawa that an intermediate radiating plate 110 (column 7, lines 4-7) is added to further increase the surface area for heat dissipation that is already available from the outside radiating plates 109. It is therefore apparent that, in both references, it is the surface areas of the strips 40 and plates 109 and 110 that effect heat dissipation. In contrast, in the present invention only the ends of the thermally conductive material are used to effect heat dispersion and cool the device. Using the two ends of the conductive material, instead of the entire surface area as is taught by the cited references,

requires significantly less surface area for effective heat dissipation. A combination of Oigawa and Fitter does not disclose this and therefore does not render the present invention obvious.

Rejection of Claims 18 and 22 under USC 103(a)

The Examiner has rejected claims 18 and 22 under USC 103(a) as being unpatentable over Oigawa (EP 0462005) in view of Fitter (U.S. Patent No. 4,897,626) and further in view of Jarczynski (U.S. Patent No. 5,091,666). Applicant respectfully traverses this rejection.

The Examiner states that Oigawa discloses "one or more laminations of a metallic material (109) forming an outer casing of the electric motor", "disks (110) positioned between the laminations (109) for conducting heat", and "thermally conductive strips (110) placed between preselected layers of the electrically conductive material (101)". However, the disclosure in Oigawa does not support this statement. According to Oigawa, elements101 are coils of wire (i.e. electrically conductive material) wound so as to form a circular (or square or rectangular) configuration (column 5, lines 11-17). The coils, in their entirety, are then sandwiched between elements 109 and 110 which are heat radiating plates that are fabricated from a magnetic material (column 5, lines 20-25; column 6, lines 52-57). There is no heat radiating or thermally conductive material placed between the layers that are wound up to form the coil. The thermally conductive material is placed only against the outside surface of the coil. In contrast, the present invention provides for strips of thermally conductive material to be interleaved between the layers of electrically conductive material (i.e. the windings of the core). This is significantly different from what is taught in Oigawa.

The Examiner also states that "Fitter discloses that the thermally conductive strips (40) are of a non-metallic material (column 2, lines 28-30)". However, a closer examination of Fitter shows that this is not the case. Fitter (column 2, lines 28-30) discloses that "heat dissipation elements may be formed from a thermally conductive ceramic element". While a ceramic material can certainly be non-metallic, there are a number of other different materials that are also

non-metallic, such as resin or laminate materials. While Fitter specifically calls for a ceramic material, the present invention is not so limited. Other materials are equally, if not more, desirable (refer to page 4, lines 9-24 of the specification). The present invention is concerned with the heat dissipation qualities of the material while Fitter is focused on the non-magnetic properties of the material (column 2, lines, 24-28). Thus, the claims of the present invention refer to non-metallic materials instead of the ceramic material taught by Fitter.

The Examiner further states that Jarczynski discloses means for conducting heat at the end of conductive strips. However, Jarczynski teaches a cooling method that requires fluid-filled passageways to remove heat from the core (column 6, lines 25-33). There is no other cooling means provided by Jarczynski to remove heat from the motor. In contrast, the present invention provides thermally conductive strips for cooling the motor, while the use of a thermocooler placed adjacent to the motor casing is an option if additional cooling is desired. Further, a thermocooler is only one of many different types of cooling means that could be employed.

There is no teaching or suggestion in either of the references that the references either could or should be combined. However, if even the references were combined, the resulting combination would provide a series of coils (of electrically conductive material) sandwiched between non-magnetic thermally conductive strips with no thermally conductive material contained (i.e. interleaved) within the coil. As is clearly indicated in the claims of the present invention, non-metallic thermally conductive strips are interleaved between the thermally conductive strips as they are wound. The claims of the present invention are therefore not obvious in view of the cited references.

Conclusion

In view of the amendment and these remarks, applicant respectfully requests reconsideration of the rejection of the claims and that the claims now be allowed. The Examiner

is invited to contact applicants' attorney at the number indicated below if further discussion related to any of the items included within this response will help advance the case to allowance.

Kindly charge any additional fee, or credit any over-payment, to Deposit Account No.50-0281.

Respectfully submitted,

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Response Due (with 2 month
Extension of time): January 12, 2002
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

18. (amended) An electric motor comprising:

one or more laminations of a metallic material forming an outer casing of the electric motor;

one or more circular non-metallic, flat, thermally conductive disks positioned between said laminations for conducting heat generated by an electrical current flowing within the motor through said conductive disks;

an electrically conductive material wound in a plurality of layers within the laminations so as to form an electric field that drives an armature when an electrical current is applied;

thermally conductive strips ~~placed~~ interleaved between preselected layers of the electrically conductive material, said thermally conductive strip extending outside of the area covered by the electrically conductive material; and

means for conducting heat at the end of the non-metallic thermally conductive disk and the thermally conductive strips thereby cooling the motor.

21. (amended) A method for cooling an electrical device having layers of electrically conductive material wound on to a laminated core having a heat generating component comprising the steps of:

placing one or more non-metallic, flat, thermally conductive strips in contact with the heat generating component across its entire length, said thermally conductive strip extending outside of the area covered by the electrically conductive material and core and in physical contact with the electrically conductive material, thereby receiving heat from the electrically conductive material, and

removing heat from a first end and a second end of each of the thermally conductive strips.